

# the Mecheleciv



VOL. 18

DECEMBER, 1958

NO. 3

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- THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
- PRINCIPLES OF AIR COMPRESSION



**SCHOOL OF ENGINEERING  
THE GEORGE WASHINGTON UNIVERSITY**

**DECEMBER 1958**

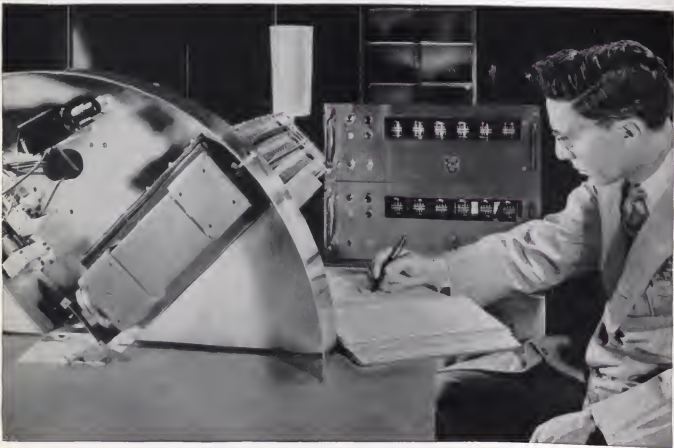
# He's making sure that "C" rations don't spoil

The tin coating on "C" ration cans does not have to be thick—but it is important that it be evenly distributed to give sure protection for the contents. But how can you measure and inspect a coating that's almost as thin as a shadow?

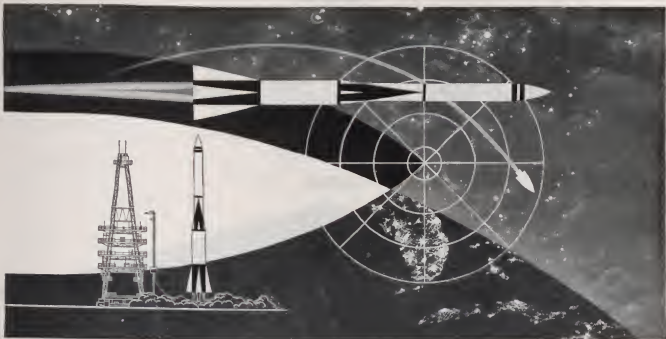
U. S. Steel does it with the unique X-ray gage you see in the picture. A beam of X-rays is directed at the tinplate. The rays penetrate the tin coating and cause the iron atoms in the steel base to fluoresce and emit X-rays of their own. As these new X-rays emerge from the base, they are partially absorbed by the tin coating. The X-rays finally leaving the tin are measured by a geiger counter and this reveals the amount of absorption and, therefore, the coating weight.

Research work like this is one of the factors that accounts for the consistent high quality of all types of steel made by United States Steel.

*USS is a registered trademark*



United States Steel



• An artist's conception of the launching of the missile, its guided flight, its track on a radarscope in its final stage.

# MINIATURIZATION for the MISSILE AGE

*Another new design frontier for copper*

*"The increasing amount of equipment carried on military aircraft . . . has made it necessary for the design engineer to cram more equipment into less space."*

*"To achieve maximum usefulness from miniaturization, all elements of the system must be reduced to the same order of size. New design techniques, components and production methods have been developed to aid the designer in reaching this goal."*

— Electronics Magazine

Many of these new design techniques are taking advantage of the properties of a very old material — copper. One of copper's big jobs is conducting electricity in control circuits. Of course, copper is the best commercial conductor, but when miniaturization takes over, many other properties of copper also become important.



Printed circuit of copper bonded to epoxy glass base, and sheet of the adhesive-backed copper used in its manufacture by Rubber & Asbestos Corp.

In the printed circuits that are the very basis of most subminiature designs, the conductors may start out as a sheet of copper foil. This foil often has to be very thin — yet free of flaws that might cause circuit discontinuities. Here, copper's ductility is vital.

Good joining properties are also important. Some of the tiny connections are resistance welded. (Copper can withstand the temperatures.) Others are soldered. (Easily done with copper and with very little solder metal.)

Complex control circuits can now be wired with flexible Tape Cable. This tape may contain as many as 50 copper conductors, side by side — and weigh only 2½ pounds per 100-ft. roll.

The standard size of each of the rectangular conductors in the tape is 0.0015 in. by 0.03 in.

Obviously, with such small cross sections, no deterioration of the conductor is permissible. Yet temperatures, particularly in missile applications, are high. The answer is found in copper which is free of oxygen—eliminating oxidation, scale formation and conductivity losses.

In other high temperature applications, copper's high thermal conductivity can be used to protect more delicate parts from excessive heat. For this reason it is useful in missile



Wiring harness of Tape Cable provides flexible, flat 50-conductor interconnection system.

nose cones. And, of course, copper's excellent corrosion resistance is often valuable in exposed parts and in tubing.

The field of missiles and rocketry is but another example of a design frontier where the versatility of copper and the copper alloys helps make progress possible.

If you'd like to know more about these metals and their design possibilities, send for "A Guide to Copper and its Alloys." Write The Copper & Brass Research Association, 420 Lexington Avenue, New York 17, New York.

EENY

MEENY

MINY



MO

***Where will  
the '59 Graduate  
go?***

Industry's demand for capable graduates in the fields of science and engineering is still exceeding the supply produced by American colleges and universities. As a result, the most promising members of this year's class may well wind up with a number of openings to consider.

In such circumstances, who would blame a bright young man for at least letting the phrase "eeny, meeny, miny, mo" slip through his mind?

Of course, there is one inescapable conclusion to be considered: openings are one thing, genuine opportunities quite another. Thoughtful examination of such factors as potential growth, challenge, advancement policy, facilities, degree of self-direction, permanence, and benefits often indicates that real opportunity does not yet grow on trees.

Moreover, the great majority of personal success stories are still being written by those who win positions with the most successful companies.

For factual and detailed information about careers with the world's pioneer helicopter manufacturer, please write to Mr. Richard L. Auten, Personnel Department.

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# THE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

By RAY P. MORALES, B.E.E. '61

In May 1934, four State Societies of Professional Engineers met to form the National Society of Professional Engineers. The need for a national organization, rather than separate State Societies, was evidenced by several problems confronting the engineering profession. Representative of these problems were the needs for:

Liaison between the profession and governmental agencies, including the armed forces.

An increased scope of the engineers' economic status.

A program introducing young engineers to the profession and guiding them.

The original requirement for membership in the National Society was merely that of registration as a Professional Engineer, but, in 1948, the requirements were broadened to admit engineers-in-training who certify their intention to register upon qualification. The present membership numbers approximately 45,500, with a continuing increase. This figure represent almost 20% of the total registered engineers. A brief look at the Constitution and Bylaws of the National Society should help in the understanding of the designs of the Society.

Article II of the Constitution states:

"... the objectives of the National Society shall be the advancement of public welfare and the promotion of the professional, social, and economic interests of the Professional Engineer."

This proverbial nutshell signifies considerably more than is immediately obvious. Consider the portion, "advancement of public welfare." This statement, as intoned, indicates that, with primary consideration given to public interest, there shall be:

A continued improvement in the education of engineers.

A greater maintenance of ethical practices.

Advisory boards and committees to oversee these activities.

The remaining objectives may similarly be expanded and the Bylaws of the National Society best accomplish this. In the Bylaws, six departmental areas of Society interest are defined. The six departments are:

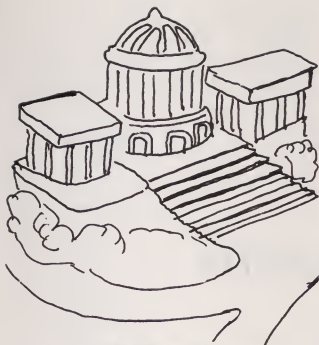
1. Professional Development
2. Professional Employment
3. Public Relations
4. Professional Relations
5. Organizational Functions
6. Policy Operations

Each department is served by several committees. The functions of these committees include education, employment, ethics, military affairs, public relations, and consideration of Young Engineers, to mention only a few.

The National Society limits its educational interests somewhat as the Engineers Council for Professional Development is the principle engineering organization established for this area of interest. The N.S.P.E., however, does strive to assist educational institutions in any way they can.

With regard to employment, the Society makes a continuing study of procedures, standards, and policies of employment of Professional Engineers. State and National laws related to employment of engineers are also a subject of study for the Society and they are currently engaged in an attempt to re-establish the "P" or "Professional" rating in the government in order to further the recognition of the Professional Engineer.

Ethical practices are of primary importance



**Government Activity**  
 . . . . Professional help needed

to any group trying to attain public recognition. In this vein, the Society formulates, and seeks to maintain, certain ethical standards of the engineering profession. The Canons of Ethics for Engineers was adopted by the Society in 1946, and a board rendering opinions and interpretations of the Canons, for members of the State Societies, is a permanent body within the National Society.



**One of Three**  
 . . . . Trade or Profession

Young engineers are usually faced with major problems and decisions upon graduation. They also pose a problem for the profession in that the established engineer must guide them in order to maintain the standards of the profession. The National Society therefore urges all State Societies to organize and maintain a program for this guidance. These programs are presented to the National Society for review and the significant portions are consolidated and published as a guide for better programs. An example of an outstanding program is that established by the Essex County Society for Professional Engineers, a chapter of the New Jersey Society for Professional Engineers. This program was commended in full and sent out to all affiliations of the N.S.P.E. for consideration in conjunction with the development of a Young Engineers' Month.

(Please turn to page 16)



**Engineers and Military**  
 . . . . Programs Through Cooperation

# PRINCIPLES OF AIR COMPRESSION

By FRANK NARR, B.E.E. '60

When air is compressed, heat is created and when this compressed air expands, heat is absorbed. This is basically what happens in refrigeration in which particular gases are used instead of air.

There are two types of air compression, adiabatic and isothermal. Adiabatic air compression is having air compressed with no loss of the heat of compression. Isothermal air compression is having air compressed with a complete loss of the heat of compression. The above conditions can be obtained approximately in the laboratory; they are never obtained in the field.

In portable and stationary air compressors, some of the heat of compression is lost through the cylinder heads and walls, although the compression more nearly resembles the adiabatic.

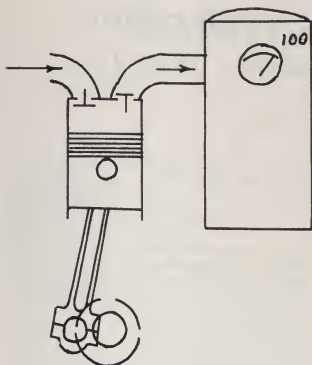
A few figures will give an idea of the approximate heat of compression in an air compressor. When air under standard atmospheric conditions is compressed to  $\frac{1}{2}$  its original volume, a gauge pressure will be approximately 24 lbs. and the temperature 230° F; at a 43rd of its original volume the pressure will be 52 lbs. and the temperature 340° F; at  $\frac{1}{4}$  the volume 87 lbs. and 440° F; and at  $\frac{1}{14}$  the volume 575 lbs. and 990° F.

The above mentioned gauge pressure is the pressure above barometric pressure or the pressure recorded by an ordinary pressure gauge.

Another term that comes to mind is that used in calculations of flow of air and gases under pressure; it is absolute pressure. Absolute zero

pressure is the pressure if there would be no weight of the air above the earth's surface. It is the pressure of a perfect vacuum and is the zero point corresponding to the 14.7 lbs. on the standard barometer. Absolute pressure, therefore, is gauge pressure plus barometric pressure.

Furthering our investigation in the field of air compressors we use the term "piston displacement." Piston displacement of a reciprocating machine is the volume displaced by the piston and is expressed in cubic inches. It is the total volume displaced by all of the pistons in one revolution. As an example: a four cylinder engine has a bore of 3  $\frac{13}{16}$ " and a stroke of  $4\frac{1}{2}$ ". The area of each piston is 11.416 square inches. This multiplied by  $4\frac{1}{2}$ " stroke gives 51.372 cubic inches, the displacement of each cylinder. The displacement of the four cylinder engine is 4 x 51.372 or 205.488 cubic inches. The piston displacement of an air compressor is expressed in cubic feet per minute. To obtain the piston displacement of all the cylinders must be multiplied by the number of revolutions per minute and then reduced to cubic feet by dividing by 1728. Consider the above air compressor, four cylinder, 3  $\frac{13}{16}$ " bore and  $4\frac{1}{2}$ " stroke with a cubic inch displacement per revolution of 205.488, and operating at 1320 revolutions per minute and we obtain 205.488 x 1320 and divided by 1728, or 157 c.f.m. (cubic feet per minute) piston displacement.



Single Stage Compression

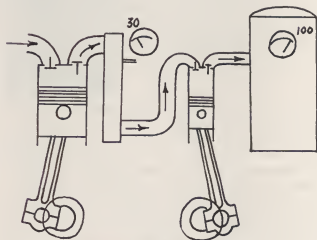
Cylinder volume and piston displacement are often confused. In the cylinder head, there is a space from which it is not practical to have all of the air removed. This is because the piston should not touch the head at the end of each stroke, nor should all of the air be removed from the spaces around the valves. In an engine that is the combustion chamber. In a compressor it is clearance. The cylinder volume is the total volume of the clearance, or combustion chamber, and the piston displacement.

We next advance to the topic of compression ratio. Compression ratio is the ratio of the cylinder volume to the clearance volume, or the ratio of the cylinder volume to the combustion chamber volume as in the case of an engine or air compressor. When an engine has a compression ratio of 6 to 1, it is meant that the ratio of the cylinder volume to the volume of the combustion chamber is 6 to 1; i.e., the amount of gas or air in the cylinder when the piston is at the outer end of the stroke is 6 times the volume when the piston is at the inner end of the stroke. The air is compressed to  $1/6$  of its original volume. It is now said that the air is compressed to 6 atmospheres.

At this point, an interesting subject is the rating of compressors. Air compressors may be rated in four ways.

1. *Bore and Stroke* of the cylinder yields the size of compressor. From the knowledge of bore and stroke and the number of revolutions, the piston displacement can be computed and the air delivery determined.
2. *Piston Displacement*.
3. *Actual Free Air Delivery* is given in cubic feet per minute at a certain gauge pressure. A compressor that is delivering 105 cubic feet of air per minute is taking in all of the air from 105 cubic feet of space every minute, and compressing it; when that air is again expanded to the same conditions of temperature and atmospheric pressure, it will again occupy 105 cubic feet of space.
4. *Compressed Air Volume When Compressed* is used in the laundry industry where cylinders must be filled with compressed air. It is stated in cubic feet occupied by the compressed air at the stated pressure.

When discussing air compressors, we run into the term "stages" of a compressor. Stages are the number of compressing elements required to obtain the final pressure. A single stage compressor is one in which compression from initial to final pressure is completed in a single compressing element. A multi-stage compressor is one in which compression from initial to final pressure is completed in two or more compressing elements. A single stage compressor may have any number of cylinders, but each cylinder compresses air from the initial to the final pressure. A two stage compressor may have more than two cylinders, but all of the first stage cylinders will only compress the air to some partial pressure, and all of the second stage cylinders will compress the air from this partial pressure to the final pressure.



Double Stage Compression

# Zero Mass—Infinite Acceleration

## ... Engineering Activities Pick Up

By WOODY EVERETT

*Engineer's Council President*

In the first three months of this school year, the student body of the School of Engineering has done itself proud. It has presented to the School some of the best programs that the professional societies have ever seen; it has entered into every phase of University life open to it with a zeal; it elected three of the five finalists for Homecoming Queen; its candidate for Homecoming Queen was chosen for that position; it entered a float into the Homecoming Parade and placed second in its division; it helped to promote the first "Parents' Day" in the School; it has contributed the first major part of the growing tradition of the School; it has become closer tied to the Faculty and the Alumni Association than ever before; it has expressed its interest in furthering interest and co-operation among the various parts of the School.

Despite the many advances of the student body toward civic interest, the initial inertia has not yet been completely overcome. There is still the need for the large majority of the engineering students to express interest in what is happening around the school. Here are some of the activities that are most in need of student support: The annual Engineers' Banquet and Ball scheduled for May 9, 1959; The engineering magazine, *Mecheleciv*; The Engineers' Guide; The engineering fraternities and the professional societies. These activities are continual—they need the continual and ardent support of the students, both in help and constructive criticism. Send your ideas and suggestion for improvements to *Mecheleciv Magazine*, School of Engineering, George Washington University, Washington, D. C.

Student activities of the University received a major setback recently when the administration refused to allow the proposed student radio station. Several of the many students who supported the radio station were engineering students, and the Engineers' Council has publicly made known its support for the basic ideas of the station. The radio station was refused despite the proposed aid of the Speech Department, the Electrical Engineering Department, the Engineers' Council, and many students active in various organizations throughout the University. Already the question is being put to y.t., "How does anyone think the status of student activities

will be improved if the best of the ideas for improving them are rejected?"

The students of the School of Engineering should take particular pride in the portraits of the past Deans of the School of Engineering, soon to be permanently hung in Tompkins Hall. These portraits represent time and effort of the Council for the past three years. The project was started by Tony Lane, who is now a student in the Law School, way back in the fall of 1956. Tony gathered information on the past Deans and had Audrey Poole, a student in the Corcoran School of Art begin work on the portraits. Tony graduated in 1957, and the project was taken over by Frank Narr, who is presently a student in the School of Engineering. Frank had the final portrait painted; then had the complete group framed. This was completed just before the end of school last year.

The total project cost the students a great deal in time, money, and effort, but the reward is that the School of Engineering is beginning a new phase of school tradition.

One project that is sure to gain the interest of the students is the proposed remodeling of the Davis-Hodgkins House. The Engineers' Council, 1958-59, has set aside a good portion of the budget for repairs and remodeling of the House. The first step in the long-range plan is to make the basement into a soundproof study room, which will also be large enough for assembly-type meetings. This step calls for rearranging the bearing walls in order to facilitate more space.

Of current interest and importance to the student activities of the School, is the equipping of the darkroom in the basement of Tompkins Hall. The room is being equipped by the Engineers' Council in order that pictures of School events may be taken, developed, and printed at a nominal cost to the activities. The best of the pictures will find their way into the Engineering School Section of the *Cherry Tree*, which will consist of three double-page spreads this year. The official photographer is Jack Bradley, and any questions concerning the taking of pictures for the activities should be directed to him in care of the Engineers' Council.

# Familiar Faces

DOROTHY NYE, although she is only a freshman, will certainly prove to be a very familiar face here at G. W. In the few short months that she has been here, Dottie has already managed to be elected freshman representative to the Engineer's Council, and is actively engaged in working on the *Mecheleciv* staff. Outside of the engineering school, she is also in the Angel Flight of the AFROTC.

Dottie, having lived on a ranch in Texas most of her life, can ride and train a horse expertly and has even attempted roping a calf. As a hobby she plays a guitar quite well and has played and sung on the radio. Since her home is near the Mexican border, she has learned to speak Spanish fluently.

In spite of her colorful background, Dottie was nevertheless born in Washington and spent the last two years of high school at St. Agnes School in Alexandria, Va.

CLIF HALL, present editor of the *Mecheleciv*, came to the G. W. School of Engineering as an electrical engineering major after serving six years in the United States Navy. He was stationed aboard destroyers except for the time spent in technical schools.

Clif is a true country boy at heart since he was born and raised on a farm in Springville, Utah. He is now married to a girl from Colorado, and they have a two year old son Michael.

Outside of his work in school, Clif holds membership in several campus activities. Besides being editor of the *Mecheleciv*, he belongs to Theta Tau, Pi Delta Epsilon, and the student branch of AIEE-IRE. When not working on these activities, Clif enjoys hunting, fishing, and gardening. His pet peeve is magazine deadlines, and his favorite advisor is Deacon Ames.

After graduation Clif plans to work in the Western states. His widespread interests in the engineering field seem to indicate a career in the management field rather than specializing in one particular field.

TOM COLEMAN possesses one of the most familiar faces seen in the vicinity of the Davis-Hodgkins House.



He seems to be the most active person in the engineering school. His many activities include treasurer of Pi Delta Epsilon, *Mecheleciv* Business Manager, Engineers Council Treasurer, and a member of Sigma Tau and Theta Tau. It was through his efforts that the

three Homecoming Queen candidates put up by the engineering organizations were chosen as finalists.

Before coming to G. W., Tom attended the University of Virginia. He was a member of Tau Kappa Epsilon while at U. Va. He also served in the Army for two years and spent one year at the Capital Radio Engineering Institute.

After he graduates in June, Tom wants to establish a reputation as a competent engineer and then go into management. With his ability for organization and abundance of new ideas coupled with an affinity for hard work, Tom is sure to succeed in whatever he decides to do.

FRANK NARR, an Electrical Engineering major, was born in Washington, D. C., and attended Sault Head High School.

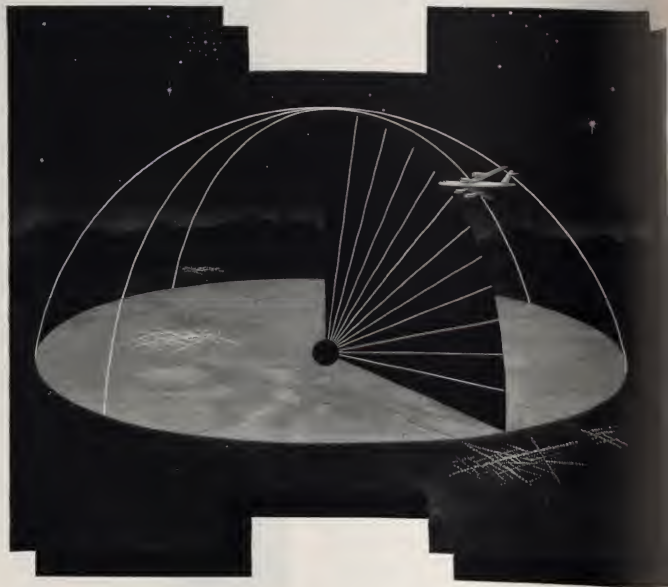
His activities include the *Mecheleciv* staff, Theta Tau, and AIEE-IRE. He is a past member of the Engineer's Council and is in Pershing Rifles of the ROTC. One admirable activity was his arrangement for the completion of a series of paintings for four past deans of the School of Engineering which were recently presented to the school.

Outside of his school activities, Frank was employed during the summer by Moeller Air Compressor Service Inc. as job foreman on a swimming pool project.

Frank's hobbies are various and do not center around his chosen field of study in the least. He is interested in a nursery enterprise, runs a model railroad, and is an amateur photographer. His favorite instructor is Deacon "Dad gum it" Ames of the Electrical Engineering Department.



# MAKING UMBRELLA



# THAT NEVER LEAK

To achieve umbrella-like radar protection, Hughes engineers have developed systems which position radar beams in space by electronic, rather than mechanical means. These unique three-dimensional radar systems are digitally programmed to instantaneously detect high speed enemy aircraft, even at low altitude.

Another Hughes system using radar information is the Hughes Electronic Armament System. This system pilots high-speed jet interceptors from take-off to touch down... and through all stages of the intercept. Both radar and infrared guidance systems direct today's most sophisticated air-to-air guided missile—the Hughes Falcon.



Research on the Maser (Microwave Amplification by Stimulated Emission of Radiation) is directed towards applications of a portable, airborne Maser for missiles and aircraft.

Members of our staff will conduct

## CAMPUS INTERVIEWS

on February 13. For interview appointment or informational literature consult your College Placement Director.

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Advanced new projects are under way in all areas of Hughes. Presently under study are Space Vehicles, Ballistic Missiles, Nuclear Electronics, Advanced Airborne Systems, AICBM, and Subsurface Electronics... just to name a few. Hughes Products, the commercial activity of Hughes, has developed an electronic control system which automates a complete and integrated line of machine tools. Also under way at Hughes Products is the development of revolutionary new semiconductor devices.

The highly advanced and diversified nature of Hughes projects—in the air, on the ground, and for industry—provides an ideal environment for the graduating or experienced engineer.



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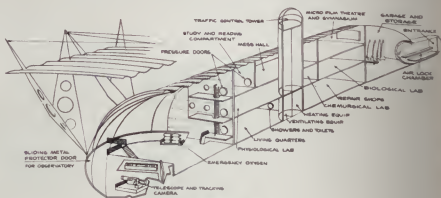
# NEWS IN INDUSTRY

**Moon Building:** Plans for a permanent "moon building" to house living quarters for moon explorers, laboratories for scientific research, maintenance shops for space vehicles and stations for earth-moon communications have been announced by the Wonder Building Corporation of America. Because of the present lack of knowledge and great divergence of opinion concerning the moon's surface, the moon building has been designed for the worst condition anticipated—a sea of dust upon which the building would float, anchored by heavy weights suspended by cables from the body of the structure. If the moon's surface proves to be sufficiently solid, it could then provide normal support for the building.

In actual size, the moon building would be 340 feet long, 160 feet wide and 65 feet high. Including air lock and plastic observation bubble, it would measure 520 feet in length. The building would be fabricated of aluminum alloys which combine high strength and low weight with ease of fabrication. Aluminum also provides a good reflecting surface which aids cooling problems. Above and separated from the roof of the building is a slightly curved umbrella-shaped

protective meteoric shield, designed to ward off the gnatlike rain of interplanetary meteoric dust which descends with great velocity on the barren surface of the moon. The shield would be 460 feet long, 380 feet wide and 83 feet high. The entire

sleeping, cooking, eating, and recreation; physics, chemistry, and biological laboratories; control tower for communication, meteorological studies, earth observations, astronomical observations, traffic control, etc.; air conditioning, heating, power, and re-



MOON BUILDING

shell of this building, and the protective barrier, would be made of pre-engineered metal sheets secured by simple nut and bolt fasteners and welded structural connections.

Inside the moon building are: living quarters, including rooms for

refrigeration plants, oxygen producing units, extreme-temperature regulating devices, water supply and sewage processing plants; machine shop and equipment maintenance areas.

Entrance to the moon building is made through an air-lock at one end, adjacent to which would be constructed a rocket landing area. Complete internal pressurization of the hermetically-sealed building provides an air pressure of at least 10 pounds per square inch, close to earth's normal atmospheric pressure of 14.7 pounds, the air pressure used in high altitude airliners. Special refrigerating and heating plants cope with the extreme temperatures which abound on the moon. Day and night on the moon are about two weeks long, with temperatures at lunar midday reaching 214 degrees F; at sunset, 32 degrees F, and at midnight, -243 degrees F. There are no windows in the moon building, since ultraviolet radiation, normally absorbed by the earth's atmosphere, would be suffi-

(Please turn to page 19)





# Engineering careers all over the map!

Many young engineers who join Western Electric find themselves working not too far from home . . . for there are 22 Western Electric manufacturing plants across the country. But wherever these engineers are located, they share in exciting assignments that stem from our job as manufacturing and supply unit of the Bell System.

Since our work is geared to a continual demand for more and better telephone equipment, Western Electric engineers are constantly exploring relatively new technical fields. Some current examples: electronic switching, miniaturization, microwave radio relay, semiconductors, automation. They also pioneer in working with metals and alloys, raw materials, testing devices, chemical processes and the like.

Added to challenging assignments like these in production techniques and processes is our nation-wide distribution job. Here, engineers have key roles in devising systems for the supply and repair of telephone equipment. Elsewhere, telephone central office equipment is installed in thousands of cities and towns each year using tools, test sets and methods devised by Western Electric engineers. They also work with our purchasing people in buying the things needed by the Bell System. And they are responsible for engineering those defense projects assigned us by the government because of our specialized experience. Example: the U. S. Army's Nike guided missile systems.

To help our engineers keep abreast of technical advancements, we recently set up three special full-time, off-the-job study centers — in New York, Chicago and Winston-Salem, N. C. Here Western Electric engineers delve into such subjects as computers and semiconductors. This kind of training helps to insure professional growth.

What's the future for the management-minded Western Electric engineer? Consider these facts: 55% of the college graduates in our upper levels of management today have engineering degrees . . . in the next ten years some 7,000 key positions will have to be filled by newly promoted people, engineers included.

Western Electric technical fields include mechanical, electrical, chemical and civil engineering, plus the physical sciences. For more information pick up a copy of "Consider a Career at Western Electric" from your Placement Officer. Or write College Relations, Room 1111D, Western Electric Company, 195 Broadway, New York 7, New York. And be sure to sign up for a Western Electric interview when the Bell System Interviewing Team visits your campus.



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## ENGINEERS PROFILE

### ... Is This You?

The following is what Gaynor & Ducas, Inc. has decided is a profile of the typical engineer. Do you agree?

(Reprinted from Product Engineering)

Engineers as a group are well above average in intelligence.

They tend to be more thing-minded than people-minded. They are not usually at their best in situations which call for a large vocabulary in oral or written expression.

They are methodical and logical in their approach to their problems. They like to use "formulas" and slide rules wherever possible and to feel that what they are doing is practical and effectual.

They dislike quick deadline immediacy—prefer to take time to analyze and think through the implications of the problem.

They are fundamentally "down to earth" and dislike exaggeration.

They are quite independent, and better able to direct themselves in their work than most professional people.

They accept the requirements of their occupation, appreciate opportunities that are offered, work best with little or no supervision, and resent close control.

They are responsible people.

They respect authority—but only when they feel the man wielding it merits respect. (For example, an engineer or management man with a record of experience, accomplishment or success.)

They command authority from those below them. They do not delegate authority well. They are not too adroit in personnel relations, nor tender of "feelings" when they get in the way of completing the job.

They enjoy working in small groups—on specific projects. They do not like to do a "piece" of many jobs. They are friendly with those in their group; however, they form few close friendships.

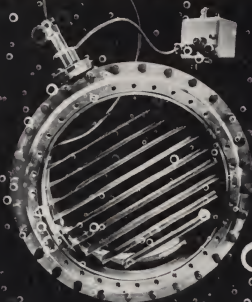
Engineers prefer methods, objects and processes to either ideas or people.

(Please turn to page 16)

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# NEW PHENOMENON IN PHYSICS UNCOVERED



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ments are underway in challenging, important work at AiResearch in missile, electronic, nuclear, aircraft and industrial fields.

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DECEMBER, 1958

## Starting Salaries

The Engineers and Scientists of America have conducted a study of the trends in starting salaries of new graduate engineers. From the data available we have prepared recommended minimum starting salaries for various levels of experience and class standing.

Copies of this recommended minimum standard have been sent to your Dean of Engineering, Engineering Library, Placement Director, and Chairmen of the Student Chapters of the various Technical Societies.

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## Is This You? (Continued from page 14)

They become tense and irritable when their opinions are ignored.

Their self-control is very strong, however, and they rarely express their inner feelings.

Their standards are high. They have little tolerance for inadequacies on the part of themselves or others. They have an inner fear of failure stronger than is found among members of other professions.

They are constructive in both their occupational relationships and their social and public activities.

Their strongest concerns are family and personal advancement.

They want to build solid, successful careers.

They believe they work harder than non-engineers.

Their professional training is reflected also in their home life. In their personal life, as on the job, they like to plan and work toward a goal or objective.

They are efficient family managers. Cautious, conservative and orderly, they act with energy and competence.

They respond to pressure by putting forth increased effort and perseverance.

They live steady lives, and impart their personal balance to their families. Their marriages are not likely to fail.

## N.S.P.E. (Continued from page 5)

The entire report included the following points:

1. Need for the "Young Engineer" Activity.
2. Definition of a "Young Engineer."
3. N.S.P.E. Young Engineers Committee Survey.
4. Appraisal of Programs.
5. Example of an outstanding program.

Considering the size of the National Society at birth (2,500 members in four state societies) and its present size (45,500 members with 45 affiliated state societies and 350 local chapters), it is evident that the Society is not only succeeding in its objectives, but is attaining the national recognition it requires, from the engineers themselves, to be able to help the engineering profession in every way possible. Engineers are professionals just as are doctors, lawyers, etc. Public recognition of this fact will eventually come forth but the sooner it is brought about, the sooner its advantages can serve the engineer. This is the aim of the National Society of Professional Engineers.

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**Aeronautical engineer Robert Claude**, Porks College of Aero Technology, BS Aero Eng. '50, engineers compressors for wind tunnels.



**Application engineering** on large power transformers is handled by Michael Waterman, Case Institute of Technology, BSEE, '47.



**Sale of large centrifugal pumps** to a wide range of industries is directed by Howard Godfrey, Oregon State College, ME '48.



**Field sales of America's widest range of industrial equipment** is choice of Michael A. Mooney, University College, Dublin, BSE '53.

## proved excellent springboard to



**Sales and promotion man Irving Fisk**, Clarkson College, EE '52, works with large power circuit breaking equipment.



**Sales manager** of large steam turbine generator units is interesting specialty of John M. Crawford, Clemson College, BME '49.



**Sales engineering** of high voltage electrical control is specialty of Ernest Horne, graduate of Alabama Polytechnic Institute, EE '49.



**Nuclear engineer Raymond W. Klecker**, University of Southern California, EE '49, is supervisor of design of nuclear reactors.

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The course, incidentally, was started in

1904, and most of the A-C management team are graduates of it.

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# ALLIS-CHALMERS



A-5601

# Theta Tau

Theta Tau began its full activities schedule with a beer party for prospective pledges. This affair was held Friday, September 26 in the backyard of Deacon Ames' house, which is located near the Decarla Reservoir. This affair marked the beginning of the formal pledging of the fall pledge class.

The second social event of the fall term was the Fall initiation Banquet and Ball. This affair was held Saturday, October 25, at the Brooksfarm Restaurant in nearby Maryland. The Banquet and Ball marked the end of the pledge program and the pledges completed the formal initiation ceremony which had begun earlier in the day. The highlight of the program was, as usual, the skit of the pledge class, and the six pledges, Gerry Cornelius, Bill Duff, Ray Howland, John Petrick, Lee Potterton, and John Pyle, carried it off in true Theta Tau style, fater they had partaken of suitable amounts of inhibition removers. They followed this skit with a rendition of the Theta Tau Song, and the intermission program was completed with the entire membership of Theta Tau joining in a "soul-tugging" and "emotion provoking" rendition of the same song. This splendid spec-

tacle so inspired two of the members, Wayne Davis and Jake Lemair, that they repeated a portion of their initiation skit concerning the merits of "falsies," from an engineering point of view of course.

The dance broke up at twelve, due to zoning regulations, and the majority of the members, and their dates or wives, adjourned to an alumni member's apartment where a hula hoop party was begun. This party gave indications of lasting all night but unfortunately the Metropolitan Police Department, alerted by irate neighbors, paid three visits. The third visit marked the end of the party because the officers informed the party goers that if they made a fourth visit they would be accompanied by a Paddy Wagon. The apartment then emptied leaving as the only reminder of the festivities a "No Parking" sign which someone had collected while in transit, and which the officers had not noticed.

The third and latest social event was the annual Shrimp Feast, which was held on Veterans' Day at Jake Lemair's country home. This affair consisted of an all-day bout of beer drinking and shrimp eating, with lightly interspersed periods of athletic activities, including football, volleyball, and horseshoes.

The intramural sports participation of Theta Tau has been carried out under the able direction of Athletic Director Vic Weiner, and as of this date members have participated in football, foul shooting, ping-pong, and bowling, with basketball, tennis, golf, swimming, volleyball, baseball, and track, scheduled for the rest of the school year. In ping-pong, Jake Lemair reached the finals, and the football team has thus far compiled a 4-2 record with the only defeat by 7-0. This record won the league championship.

# Sigma Tau

The following are the Sigma Tau pledges for the fall semester: Banta, Joseph Harry, Jr.; Barnes, Lawrence Almon, Jr.; Beck, Henry Donald; Davis, Wayne Alton; Howland, Albert Ray, Jr.; Kaminetzky, Jerry; O'Neale, John Daniel; Soroko, Stanley Robert; Thau, Stephan Arthur; Tsakos, Steven; Wiggins, Thomas Breden; Brooks, Arthur William, Jr.; Burnham, John Milton; Horiuchi, Harold Shigeo.



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## News in Industry

(Continued from page 12)

ciently intense to render panes of glass or plastic useless through discoloration. Metal shutters protect the plastic observation bubbles. It has been estimated that man could establish a building on the moon in ten years.

**Mechanical Grasshopper:** A revolutionary rocket belt, already successfully tested, is literally capable of propelling a man through the air over gullies, across streams and other obstructions. The belt, project-named "Grasshopper," uses a chemical propellant rocket thrust to enable the wearer to cover ground-level distances at speeds up to 35 miles per hour. According to its developers, the belt weighs less than an infantryman's field-pack, and is completely safe and simple to operate. It may be taken off or put on easily. Estimates indicate that about two years will be needed before the belt meets required performance capabilities. Once perfected as a flying belt, it will allow troops to actually fly for short periods of time, and land safely. With complete control, the wearer can choose his altitude and change direction if he desires. One of the most interesting and most speculative uses for the device is propelling men in the reaches of outer space—men who

one day will assemble America's first space stations, hundreds of miles above the earth. Such a method of small rocket propulsion may answer the problem of working in space.

**Jack Leg Drill:** A new dry, dustless jack leg drill is now on the market. A new dust collector tank which can be dumped by remote control from the drill is part of the new equipment. The advantages of dry, dustless drill-



ing, which has been used in coal mining for a number of years, are now available to the hard rock mining industry and construction tunneling. The new drill eliminates the need of using water, often times an expensive item in arid mining areas; the dry cuttings provide a continuous ore sampling, allowing the ore body to be analyzed every few feet of drilling if necessary; it does away with wet, unsafe working conditions, sinking of

pillars in muck, sticking of steels, and "lost holes"—resulting from cuttings being washed by water into previously drilled blast holes.

**Uranium Superconductors:** Uranium—the nuclear fuel that made possible large-scale useful atomic power—has yielded a new family of chemical compounds among the most unique in science. The new compounds belong to a group of substances called superconductors — materials characterized by the remarkable ability of permitting an electric current, once started in them, to flow in undiminished strength forever. The superconductors were found during research on the electrical resistance of uranium alloys at temperatures less than one degree above absolute zero —459 degrees below zero Fahrenheit. The new superconductors, four in all, include the first ever known to contain manganese and iron, two elements that always have been considered alien to the existence of superconductivity. All are known as intermetallic compounds and are alloys of uranium and one other metal. Superconductivity occurs in various metals and alloys at very low temperatures. For reasons that are not well understood, the electrical resistance of these materials suddenly drops to about one-millionth of one-billionth of its normal value, permitting electric cur-

(Please turn to page 20)

# SLIPSTICK SLAPSTICK

When I was but a little lad  
Upon my mother's knee,  
She used to ask me, "Son of mine—  
What will you one day be?"  
And I, with my slide rule in my  
hand—

the toy I loved so dear—  
Would answer, "Mamma, you should  
know,

I'll be an engineer!"  
While other little boys my age  
Were reading fairy tales,  
I'd bug my little eyes out  
Over books of logs and scales.  
The formulae they stuffed me with  
Were not sweet mild and meal—  
I'd eat equations X times Y—  
How good they made me feel!  
And so it was that pi to me  
Was nothing that I ate;

I knew it equaled three one four  
So I'd leave it on my plate.  
The calculus and algebra  
Became my bone and joint;  
What difference did it really make  
If my head came to a point?

Then, as it is in every life,  
A kindred soul I spied—  
I wooed her with exponents,  
And with fractions she replied.  
Her smile was quite symbolic,  
Her figure hyperbolic;  
Her lips were hysteresis loops,  
Her smile was quite symbolic.  
Our wedding was a joining  
Of two mathematical wizards.

We knew all calculations  
From alpha to the iizzards.  
Yet with all this wealth of  
knowledge

No matter how we try,  
The operation we do best  
Is just to multiply!

He: "Whisper those three little  
words that will make me walk on air."  
She: "Go hang yourself."

Every day the guards in the Russian work camp checked out the workers as they left the grounds, to prevent stealing. For several days a guard had been watching one particular man pushing out a wheelbarrow full of straw. Every day he examined the straw suspiciously but could find nothing hidden in it.

One day, after inspecting the wheelbarrow, he said, "Look, Comrade, tomorrow I am being transferred to

Siberia. I'll never see you again, and I promise to keep your secret . . . What in the devil are you stealing?"

The worker looked around cautiously; "Wheelbarrows," he whispered.

Not only is it proper to hold an engineer's hand in the dark, but is usually necessary.

A preacher at the close of his sermon discovered one of his deacons asleep. He said, "We will now have a few minutes of prayer. Deacon Brown, you lead!"

"Lead?" cried Brown, suddenly awakening, "I just dealt!"

He: "Please?"

She: "No!"

He: "Oh, just this once?"

She: "I said definitely not!"

He: "Oh, it won't hurt."

She: "I said, definitely not!"

He: "Oh, shucks, Mom, all the other kids are going barefoot."

"When you were courting me," Mrs. Recentwed complained, "you used to catch me in your arms every night."

"Yeah, bassoo her disillusioned husband, "and now, I catch you in my pockets every night."

Attention! You can cure your roommate of snoring by good advice, co-operation, kindness, and by stuffing an old shirt in his mouth.

Prof: "Well, what did you think of the course?"

C.E.: "I thought it was very well covered. Everything that wasn't covered during the semester was covered on the final!"

First Drunk: "We're getting close to town."

Second Drunk: "How do you know?"

First Drunk: "We're hitting more people."

One oil man to another: "Hear you brought in a dry hole last week."

Second Oil Man: "Please! Let's just say I brought in a long, thin swimming pool."

Newton's tenth law—the dimmer the porch light the greater the scandal power.

Last night I held a little hand,  
So dainty and so sweet.  
I thought my heart would surely  
break,

So wildly did it beat.  
No other hand in all this world,  
Can greater solace bring,  
Than that sweet hand I held last  
night.

Four aces and a king.

Her lips clung tenaciously to his . . . once more she had forgotten to remove her chewing gum.

## News in Industry

(Continued from page 19)

rents to flow in them apparently forever. Such superconductors would make possible electrical and electronic devices not now even visualized, and would revolutionize the practices and products of these industries as we know them today. They are beginning to find application in midget computers useful for airborne control of rockets and missiles.

**Infrared Detector:** Scientists at the Westinghouse Research Laboratories have developed a new ultra-sensitive detector than can respond to less than one-twentieth of a billionth of a watt of infrared (heat) radiation. The function of the detector is to convert invisible infrared radiation into electrical signals that can be amplified and seen. It is one most critical component of a complete infrared system. The new infrared detector is a type known as a "photoconductor detector." A photoconductor is a solid material that changes its ability to conduct electricity when radiations such as infrared or visible light strikes its surface. As a result, changes in the intensity of infrared radiation reaching the photoconductor are converted into changes in the amount of electric current flowing through it. The detector is highly sensitive to infrared up to a wavelength of 10 microns, which corresponds roughly to the peak radiation at room temperature. At the same time, it is about 10 times faster than any previously measured photoconductor detector.



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The Army's first operational rotor-tip propelled jet helicopter—built by Hiller.

The camera has caught the fuel spray pattern within the rear end of the ram-jet engine even though passing by at about 450 miles per hour.



## Project:

# Inspect rotor tip jets for a whirlybird

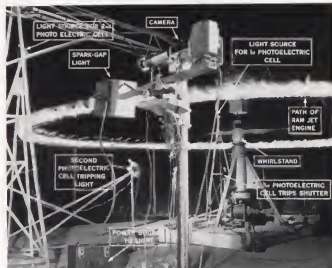
Hiller Helicopters wanted facts on the fuel spray pattern of a ram-jet engine whirling at speeds up to 700 feet per second. Photography got the job.

WHEN HILLER HELICOPTERS of Palo Alto, Cal.—a pioneer in vertical take-off aircraft—developed a rotor-tip ram-jet engine, they knew the fuel spray would be subject to high air velocity and centrifugal force up to 1200 G's. Would the fuel spray be deflected outward and cause the jet to lose thrust? They wanted to know. So they set up the camera with its fast eye to catch what otherwise couldn't be seen. And they learned the right angle of air intake and nozzle to obtain the greatest power.

Using photography in research is an old story with Hiller—just as familiar as using it for improving public relations. It's an example of the way photography plays many important roles in modern-day industry.

In whatever work you do you will find that

photography will play a part in improving products, aiding quality control and increasing sales.



This is all the human eye could have seen of the whirling ram-jet engine as camera takes its picture.

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One of a series\*

## Interview with General Electric's

W. Scott Hill

Manager—Engineering Recruiting

# Qualities I Look For When Recruiting Engineers

**Q. Mr. Hill, what can I do to get the most out of my job interviews?**

**A.** You know, we have the same question. I would recommend that you have some information on what the company does and why you believe you have a contribution to make. Looking over company information in your placement office is helpful. Have in mind some of the things you would like to ask and try to anticipate questions that may refer to your specific interests.

**Q. What information do you try to get during your interviews?**

**A.** This is where we must fill in between the lines of the personnel forms. I try to find out why particular study programs have been followed, in order to learn basic motivations. I also try to find particular abilities in fields of science, or mathematics, or alternatively in the more practical courses, since these might not be apparent from personnel records. Throughout the interview we try to judge clarity of thinking since this also gives us some indication of ability and ultimate progress. One good way to judge a person, I find, is to ask myself: Would he be easy to work with and would I like to have him as my close associate?

**Q. What part do first impressions play in your evaluation of people?**

**A.** I think we all form a first impression when we meet anyone. Therefore, if a generally neat appearance is presented, I think it helps. It would indicate that you considered this important to yourself and had some pride in the way the interviewer might size you up.

**Q. With only academic training as a background, how long will it be before I'll be handling responsible work?**

**A.** Not long at all. If a man joins a training program, or is placed directly on an operating job, he gets assignments which let him work up to more responsible jobs. We are hiring people with definite consideration for their potential in either technical work or the management field, but their initial jobs will be important and responsible.

**Q. How will the fact that I've had to work hard in my engineering studies, with no time for a lot of outside activities, affect my employment possibilities?**

**A.** You're concerned, I'd guess, with all the talk of the quest for "well-rounded men." We do look for this characteristic, but being president of the student council isn't the only indication of this trait. Through talking with your professors, for example, we can determine who takes the active role in group projects and gets along well with other students in the class. This can be equally important in our judgment.

**Q. How important are high scholastic grades in your decision to hire a man?**

**A.** At G.E. we must have men who are technically competent. Your grades give us a pretty good indication of this and are also a measure of the way you have applied yourself. When we find someone whose grades are lower than might be expected from his other characteristics, we look into it to find out if there are circumstances which may have contributed.

**Q. What consideration do you give work experience gained prior to graduation?**

**A.** Often a man with summer work experience in his chosen academic

field has a much better idea of what he wants to do. This helps us decide where he would be most likely to succeed or where he should start his career. Many students have had to work hard during college or summers, to support themselves. These men obviously have a motivating desire to become engineers that we find highly desirable.

**Q. Do you feel that a man must know exactly what he wants to do when he is being interviewed?**

**A.** No, I don't. It is helpful if he has thought enough about his interests to be able to discuss some general directions he is considering. For example, he might know whether he wants product engineering work, or the marketing of technical products, or the engineering associated with manufacturing. On G-E training programs, rotating assignments are designed to help men find out more about their true interests before they make their final choice.

**Q. How do military commitments affect your recruiting?**

**A.** Many young men today have military commitments when they graduate. We feel it is to their advantage and ours to accept employment after graduation and then fulfill their obligations. *We have a limited number of copies of a Department of Defense booklet describing, in detail, the many ways in which the latter can be done. Just write to Engineering Personnel, Bldg. 36, 5th Floor, General Electric Company, Schenectady 5, N. Y.* 959-8

\*LOOK FOR other interviews discussing: • Advancement in Large Companies • Salary • Personal Development.

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